

Claims

1 1. A method for reconfiguring a routing network
2 comprising:

3 quiescing the routing network to preserve a first-
4 in first-out ordering of data messages within the
5 routing network; and

 reconfiguring the quiesced routing network.

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2 2. The method of claim 1, wherein said quiescing
3 further comprising quiescing control messages within said
3 routing network prior to said reconfiguring.

continued
1 3. The method of claim 2, wherein said routing
2 network comprises at least one of a logging network or a
3 sequencing network, said logging network including logging a
4 message to persistent storage within the routing network
5 prior to delivery of the message to one or more clients of
6 the network, and said sequencing network comprising
7 sequencing a message at a node of the routing network with
8 other messages received by the network prior to delivery of
9 the message to one or more clients of the network, wherein
10 said quiescing of said control messages comprises quiescing
11 any new logging acknowledgment message or sequencing
12 acknowledgment message within said logging network or
13 sequencing network, respectively.

1 4. The method of claim 1, wherein said quiescing
2 comprises sending a quiesce message from a root node to all
3 children nodes thereof using an existing routing network
4 configuration.

1 5. The method of claim 4, wherein when a node of said
2 routing network receives the quiesce message, the node
3 begins queuing any new data messages received from a client
4 thereof, forwards the quiesce message to any children nodes
5 thereof, and sends a quiesce acknowledgment to its parent
6 node, and wherein once the root node has received a quiesce
7 acknowledgment from all children nodes, all data messages in
8 a sub-tree defined from the root node have been quiesced.

1 6. The method of claim 1, wherein said routing
2 network is part of a publish/subscribe system, and wherein
3 said reconfiguring is transparent to both publishers and
4 subscribers of said publish/subscribe system.

1 7. The method of claim 1, wherein said routing
2 network comprises a continuously available broker network.

1 8. The method of claim 1, wherein said quiescing
2 comprises propagating a quiesce message from a root node
3 across a spanning tree of said routing network, said quiesce
4 message preventing any new data messages from being
5 published for routing across said spanning tree.

1 9. The method of claim 8, wherein each node of said
2 spanning tree responds to said quiesce message by sending a
3 quiesce acknowledgment message to its parent node, and
4 wherein after sending said quiesce acknowledgment message,
5 any new data message received from a client of said node is
6 queued at said node.

1 10. The method of claim 9, further comprising
2 quiescing control messages within said routing network prior
3 to said reconfiguring.

1 11. The method of claim 10, wherein said quiescing of
2 control messages comprises sending a quiesce special message
3 from said root node to a special node of said routing
4 network, said special node of said routing network
5 comprising one of a logger node or a sequencer node.

1 12. The method of claim 11, wherein upon receipt of
2 said quiesce special message at said special node, said
3 special node returns a quiesce special acknowledgment
4 message to said root node, and wherein upon receipt of said
5 root node of said quiesce special acknowledgment message,
6 said control messages within said routing network have been
7 quiesced.

1 13. The method of claim 9, wherein said reconfiguring
2 comprises sending a quiesce complete message from said root
3 node to nodes of said spanning tree, wherein said spanning
4 tree comprises an existing spanning tree configuration, and
5 then sending a configure message to said nodes using a new
6 spanning tree configuration, thereby accomplishing said
7 reconfiguration.

1 14. The method of claim 1, wherein said quiescing
2 further comprises quiescing control messages within said
3 routing network prior to said reconfiguring, and said
4 reconfiguring comprises reconfiguring said quiesced routing
5 network transparent to any clients of said routing network,
6 and wherein said routing network comprises one of a logging
7 routing network wherein messages are logged for guaranteed
8 delivery, or a sequencing routing network wherein messages
9 are sequenced for ordered delivery.

1 15. The method of claim 14, wherein said network is
2 part of a publish/subscribe system supporting content-based
3 subscription, and wherein said method is used in combination
4 with a method for routing messages within said routing
5 network, said method for routing comprising routing a
6 message to one or more clients of said network, said routing
7 being based on data content of said message irrespective of
8 any destination information that may be within said message.

1 16. The method of claim 15, wherein said routing
2 comprises logging said message at at least one logging node
3 within said network before delivering said message to said
4 one or more clients of said network, said logging comprising
5 storing said message in persistent storage.

1 17. The method of claim 14, further in combination
2 with a method for routing messages within the routing
3 network, said routing method comprising sequencing a message
4 at a node of the routing network with other messages
5 received by the routing network to produce an ordering of
6 message delivery within the routing network, and delivering
7 the message to one or more clients of the routing network
8 while maintaining the ordering of message delivery.

1 18. The method of claim 17, wherein said network is
2 part of a publish/subscribe system.

1 19. A system for reconfiguring a routing network
2 comprising:

3 means for quiescing the routing network to
4 preserve a first-in first-out ordering of data messages
5 within the routing network; and

6 means for reconfiguring the quiesced routing
7 network.

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2 20. The system of claim 19, further comprising means
3 for quiescing control messages within said routing network
prior to reconfiguration thereof.

1 21. The system of claim 20, wherein said routing
2 network comprises at least one of a logging network or a
3 sequencing network, said logging network including a special
4 logger node for logging a message to persistent storage
5 within the routing network prior to delivery of the message
6 to one or more clients of the network, and said sequencing
7 network comprising a special sequencing node for sequencing
8 a message within the routing network with other messages
9 received by the network prior to delivery of the message to
10 one or more clients of the network, wherein the means for
11 quiescing of the control messages comprises means for
12 quiescing any new logging acknowledgment message or
13 sequencing acknowledgment message within the logging network
14 or sequencing network, respectively.

1 22. The system of claim 19, wherein said means for
2 quiescing comprises means for sending a quiesce message from
3 a root node to all children nodes thereof using an existing
4 routing network configuration.

1 23. The system of claim 22, further comprising means
2 for queueing any new data messages received from a client of
3 a node after the node receives the quiesce message, and for
4 forwarding the quiesce message to any children nodes of said
5 node, and for sending a quiesce acknowledgment to its parent
6 node, wherein once the root node has received a quiesce
7 acknowledgment from all children nodes, all data messages in
8 a sub-tree defined from the root node have been quiesced.

1 24. The system of claim 19, wherein said routing
2 network is part of a publish/subscribe system, and wherein
3 said means for reconfiguring comprises means for
4 reconfiguring the quiesced routing network transparent to
5 both publishers and subscribers of said publish/subscribe
6 system.

1 25. The system of claim 19, wherein said routing
2 network comprises a continuously available broker network.

1 26. The system of claim 19, wherein said means for
2 quiescing comprises means for propagating a quiesce message
3 from a root node across a spanning tree of said routing
4 network, said quiesce message preventing any new data
5 messages from being published for routing across said
6 spanning tree.

1 27. The system of claim 26, further comprising means,
2 at nodes of said spanning tree, for sending a quiesce
3 acknowledgment message to its parent node in response to
4 receipt of said quiesce message, and for queueing any new
5 data message received from a client of said node after
6 sending said quiesce acknowledgment message.

1 28. The system of claim 27, further comprising means
2 for quiescing control messages within said routing network
3 prior to said reconfiguration by said means for
4 reconfiguring.

1 29. The system of claim 28, wherein said means for
2 quiescing control messages comprises means for sending a
3 quiesce special message from said root node to a special
4 node of said routing network, said special node of said
5 routing network comprising one of a logger node or a
6 sequencer node.

1 30. The system of claim 29, further comprising means
2 for returning a quiesce special acknowledgment message from
3 said special node upon receipt of said quiesce special
4 message, wherein said routing network has been quiesced upon
5 receipt at said root node of said quiesce special
6 acknowledgment message.

1 31. The system of claim 27, wherein said means for
2 reconfiguring comprises means for sending a quiesce complete
3 message from said root node to nodes of said spanning tree,
4 wherein said spanning tree comprises an existing spanning
5 tree configuration, and thereafter, for sending a configure
6 message to nodes of a new spanning tree configuration,
7 thereby accomplishing said reconfiguration.

1 32. The system of claim 19, wherein said means for
2 quiescing further comprises means for quiescing control
3 messages within said routing network prior to said
4 reconfiguration by said means for reconfiguring, and said
5 means for reconfiguring comprises means for reconfiguring
6 said quiesced routing network transparent to any clients of
7 said routing network, and wherein said routing network
8 comprises one of a logging network wherein messages are
9 logged for reliable routing, or a sequencing network wherein
10 messages are sequenced for ordered delivery.

1 33. The system of claim 32, wherein said network is
2 part of a publish/subscribe system supporting content-based
3 subscription, and wherein said system is used in combination
4 with a system for routing messages within said routing
5 network, said system for routing messages comprising means
6 for routing a message to one or more clients of said
7 network, said means for routing being based on data content
8 of said message irrespective of any destination information
9 within said message.

1 34. The system of claim 33, wherein said means for
2 routing comprises means for logging said message at at least
3 one logging node of said network before delivering said
4 message to said one or more clients of said network, said
5 means for logging comprising means for storing said message
6 in persistent storage.

1 35. The system of claim 32, further in combination
2 with a system for routing messages within the routing
3 network, said routing system comprising means for sequencing
4 a message at a node of the routing network with other
5 messages received by the routing network to produce an
6 ordering of message delivery within the routing network, and
7 means for delivering the message to one or more clients of
8 the routing network while maintaining the ordering of
9 message delivery.

1 36. The system of claim 35, wherein said routing
2 network is part of a publish/subscribe system.

1 38. An article of manufacture comprising:

2 at least one computer usable medium having
3 computer readable program code means embodied therein
4 for effecting reconfiguring of a routing network, the
5 computer readable program code means in the article of
6 manufacture comprising:

7 computer readable program code means for
8 causing a computer to effect quiescing the routing
9 network to preserve a first-in first-out ordering
10 of data messages within the routing network; and

11 computer readable program code means for
12 causing a computer to effect reconfiguring the
13 quiesced routing network.

1 39. The article of manufacture of claim 38, wherein
2 said routing network is part of a publish/subscribe system.

1 40. The article of manufacture of claim 39, wherein
2 said publish/subscribe system includes at least one special
3 node within said routing network, said at least one special
4 node comprising one of a logging node or a sequencing node,
5 wherein said logging node is employed to log messages to
6 persistent storage, and said sequencing node is employed to
7 sequence messages for ordered delivery.

1 41. The article of manufacture of claim 40, wherein
2 said computer readable program code means for causing a
3 computer to effect reconfiguring comprises computer readable
4 program code means for causing a computer to effect
5 reconfiguring the quiesced routing network transparent to
6 both publishers and subscribers of said publish/subscribe
7 system.

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